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ECONOMIC LIBERALIZATION AND AREAL DIFFERENTIATION OF LIVELIHOOD STRATEGIES IN THE SMALLHOLDER COFFEE PRODUCTION AREA OF THE ARUMERU DISTRICT, TANZANIA

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ABSTRACT Geography is an important and complex mediating factor of the impact of macroeconomic policies on local rural livelihoods. Smallholders in the Arumeru coffee production area, located in northeastern Tanzania, have adopted different livelihood strategies to survive within the regional system under changing macroeconomic conditions. After the liberalization of the market, these farmers substantially retreated from coffee production; this has been most pronounced in the former production center. The alternative livelihood strategies that have been adopted and the net income levels of the sample rural households depend on the location, local environment, and regional system that includes the urban economy vitalized by the liberalization. For instance, horticulture and dairy production have been stimulated by the cross-sectoral impacts of the liberalization measures on various activities, including mining and tourism, in different areas of the region. These two agricultural activities exhibit spatial variation within the same system according to the availability of irrigation and the relative ease of transport. Therefore, the geographical incidences of the retreat from coffee production and the possible and/or adopted livelihood strategies are not uniform, and the extent of de-agrarianization has been, on the whole, not significant, and economically stratified.

Key Words: Coffee; Areal differentiation; Stratification; De-agrarianization; Tanzania.

INTRODUCTION

Since the beginning of the 1990s, the production and marketing of Arabica coffee have drastically declined in northeastern Tanzania. This decline has long been attributed to ageing coffee trees, poor crop husbandry, rundown central pulperies, low yields, high production costs relative to other crops, drought and poor weather, and a high incidence of disease (Tanzania, 1998; Baffes, 2003). Although doubts have been raised about whether the coffee market has truly been liberalized during the last decade (Cooksey, 2005) and the impact of this liberalization on coffee farmers may have been generally positive (Winter-Nelson & Temu, 2002), the decline in coffee production has been partly due to the economic liberalization that led to the collapse of credit provisions for agricultural inputs through cooperatives. A related switch from "slow" to "fast" crops, or to crops that generate regular year-round income, occurred as a result of an increase in demand for cash income in the context of inflationary pressures and the elimination of various subsidies (Bryceson, 2005; Ponte, 2002). Therefore, the retreat from coffee, once the primary cash crop, in conjunction with the more general effects of economic reform on other aspects of rural livelihoods, may have led

to a major rural socioeconomic change in the production areas considered.

As a voluntary or involuntary response to stagnant and downward trends in agriculture, and economic uncertainty and risk, made greater by market liberalization, rural households in Sub-Saharan Africa, including Tanzania, have shown a growing tendency toward non-agricultural income diversification (Bryceson, 1997, 2005; Ellis, 2000; Ponte, 2002). Whether the retreat from a major cash crop leads to such a process of de-agrarianization and whether this process accentuates economic stratification in rural societies are important concerns in studying the decline of coffee production in northeastern Tanzania.

When viewed at the village level, however, the retreat of smallholders from coffee may be influenced by the variety of possible livelihood strategies. The range of available strategies may, in turn, depend on the location and environment of the villages, as well as their relationships with other localities, according to how different aspects of economic liberalization have impacted various localities. An impact of liberalization on one sector of a locality in the regional system may extend in various ways to other sectors in other localities in the same system. Therefore, livelihood strategies are developed within the regional system under changing macroeconomic conditions. In particular, the cross-sectoral repercussions of liberalization spread across different localities, and understanding these repercussions is important for examining the changing production of coffee.

Previous studies of rural livelihood and poverty in Tanzania have shed important light on their geographical variation, both in relation to village accessibility to roads and public facilities (Ellis, 2000), and their agroecology (Ellis & Mdoe, 2003). However, these studies did not address whether the selected villages were situated in (and thus their livelihoods operating within) a regional system in which different localities have different responses to exogenous stimulation. This study contends that geography is an important mediating factor of the impact of macroeconomic policies on local livelihoods. Its impact should be taken into account, along with the consideration of inflation, the exchange rate, and the rural–urban terms of trade (e.g. Sen, 2005). The geographical viewpoint is also relevant when examining a relatively compact set of settlements that constitute a coffee production area on the flanks of a mountain.

This study focuses on a major production area for wet-processed, mild Arabica coffee in Tanzania: the Arumeru production area (1800–1200 m asl) in the Arusha Region. Although this Region includes vast semiarid areas of subsistence pastoralism and large-scale wheat production, most of the population is concentrated in the vicinity of Mount Meru (4,565 m), especially on its more humid, southern flanks. This area is a relatively developed zone of the cash economy of Tanzania into which crops, such as coffee, were introduced during the colonial era. The subsequent introduction of various crops shaped the history of indigenous agricultural intensification (Spear, 1997). The largely Meru-dominated villages extend the upper, middle, and lower elevations of the mountain (1800–900 m), and annual rainfall is about 1,500 mm, 1,200 mm, and 800 mm, respectively.

In the absence of an overall understanding of the spatial variation in the retreat from coffee production for the entire production area, this study first explores this areal differentiation, considering three villages with different degrees of pro-

duction decline as case studies. Then, examining the households in these villages, their livelihoods, especially their net income portfolios, are compared. The results illustrate the spatial variation in livelihood strategies, and help elucidate its association with economic stratification. In particular, this study examines the relationship between the livelihood strategy adopted and the net income level in different geographical settings. Finally, the areal differentiation is partly examined in terms of the differential and cross-sectoral effects of economic liberalization in relation to village location, village environment, and the regional system that includes the urban economy vitalized by the liberalization. Because this study focuses on the rural population, their increasing migration to urban areas is beyond its primary scope. Instead, this study discusses and analyzes rural livelihood diversification, stratification, and de-agrarianization *in situ*.

CHANGES IN COFFEE PRODUCTION

I. Coffee Processing and Marketing in the Arumeru District

The primary processing of coffee in the smallholder sector of the Arumeru production area is conducted by smallholders themselves before selling to cooperatives or private coffee buyers, or by central processing units (central pulperies) owned by a small number of primary cooperatives and private companies. Of the 27 primary cooperatives that belong to the Arusha Cooperative Union (ACU), only five have maintained or rehabilitated their central pulperies. During primary processing, the pulp is separated from the beans, whose mucilage is removed via fermentation before being sun-dried, resulting in parchment coffee. This is delivered to curing factories for secondary processing, which consists of hulling, polishing, and grading into various categories of green/clean coffee beans according to shape, size, and density. Samples are sent for quality assessment to the Tanzania Coffee Board (TCB) in Moshi in the Kilimanjaro Region, and bulk coffee is offered for sale to licensed export companies under the national auction system organized by the TCB. This bulk coffee is transported to ports in Tanga or Dar es Salaam for shipment abroad. The ACU uses a multi-payment system on credit, while private buyers normally adopt a single, fixed-cash payment system upon the delivery of coffee at the buying centers.

In 2003, the government introduced the direct export of premium green coffee, both Arabica and Robusta of higher quality commanding premium prices, and it was exempt from sale at the TCB auctions. These exports were facilitated by contracts between buyers located outside of Tanzania and TCB-approved exporters, including farmer groups, cooperatives, large estate owners, and non-governmental organizations (Tanzania, 2003).

According to an administrative report about the crop yields for 2005/06 (Arumeru, 2006a), the Arumeru District as a whole produced 1,790,778.5 kg of parchment coffee, setting aside direct export figures, which were not available as of August 2006. This output was sold via a variety of market channels. Most primary cooperatives sold their produce through the ACU, and 24.5% of the district

total was sold in this way. Another primary cooperative offered its produce, which accounted for 0.8% of the total, directly to the national auction. Six private buyers licensed by the Arumeru District Council handled 20.7%, of which 12.7% was collected from large coffee estates. Meanwhile, the share of farmers groups (*vikundi vya wakulima*), which began to organize themselves selectively alongside cooperatives mainly after 2002 in the Arumeru District with a view to producing premium coffee, was 14.1%. Of this amount, 12% passed through the Association of Kilimanjaro Specialty Coffee Growers (AKSCG, or Kilicafe). This association was founded in 2001 as a national umbrella organization of farmers groups, with the strong support of TechnoServe, a US-based nonprofit development organization (Parrish *et al*., 2005). Of the 14.1% procured by farmers groups, 3.7% supposedly came from outside the district (personal communication received at the Department of Agriculture and Livestock, the Arumeru District Council, on August 14, 2006). Finally, 10 large estates collectively produced 39.9% of the district total.

The Arumeru District Council did not issue any licenses to private coffee buyers for the 2003/04 and 2004/05 seasons, and many farmers sold their produce outside of the Arumeru District, especially in the adjacent Hai District of the Kilimanjaro Region (Arumeru, 2006a). An officer explained that the non issuance was not only to promote newly started farmers groups, but also because of some "political" considerations (interview at the Department of Agriculture and Livestock, the Arumeru District Council, on August 9, 2006). Examining these export markets, which are now supposedly liberalized, requires special care. In particular, the political economy perspective must be addressed, especially when considering local government authorities under decentralization policies (Cooksey, 2005).

II. Areal Differentiation of the Retreat from Coffee Production

A geographical breakdown of the data is indispensable when examining the areal differentiation of smallholder coffee production in Arumeru. Before market liberalization in 1994/95, smallholders had no choice but to sell their produce to the primary cooperatives. For this reason, the ACU formerly provided all of the available information about this trade at the village and multi-village level, with the exception of the unknown amount of coffee that was smuggled abroad. The ACU data show that the smallholder retreat from coffee sales via cooperatives has been substantial and prevalent over the entire production area. As Fig. 1 illustrates, the total amount of coffee procured by primary cooperatives for the four years before market liberalization was generally larger than that for the 12 years after liberalization. Although the total amount of coffee exported from the Arusha Region (including those from large estates) has fluctuated dramatically, partly affected by the poor growing conditions of 1997/98 related to El Niño weather patterns, it has been on a continued downward trend. The amount procured by the four primary cooperatives, to which the households from the villages examined in this study sell their produce, is now very small in spite of recent price increases (Fig. 2).

Under the status quo of multiple market channels, however, data sources other than the ACU should also be consulted to draw a complete picture of the Arumeru coffee production and marketing activities. The available data concerning procurement by private coffee buyers comprise the monthly returns that these buyers filed with the Arumeru District Council. These filings report the amounts procured, by village, excluding those from large estates. As for procurement by farmers groups, most of the data are kept at the AKSCG in Moshi, and only a few cases recorded by the District Council indicate that the association was bypassed.

The combined data from these multiple sources and the ACU confirm the reality of the smallholder retreat from coffee production. As shown in Tables 1A and 1B, the annual procured amount dropped by 80% after liberalization of the market. Before the market liberalization, that is, for the period between 1990/91 and 1993/94 crop seasons, primary cooperatives annually procured 4,749,351 kg on average, while procurement through the various marketing channels during the post-liberalization season of 2005/06 totaled 816,735 kg. This large decline is even more astonishing when considering that administrative documents for the Arumeru District suggest that, of its estimated 19,000 ha of coffee crop land, 6,335 ha (33%) have been abandoned or cleared of coffee trees (Arumeru, n.d. & 2006a).

The smallholder retreat from coffee production has by no means been geographically uniform in the Arumeru production area (1800–1200 m). Rather, it exhibits spatial variation: the retreat from coffee production has been more intense (smaller figures of the retention index in Table 1C) in the middle (1599–1500 m)

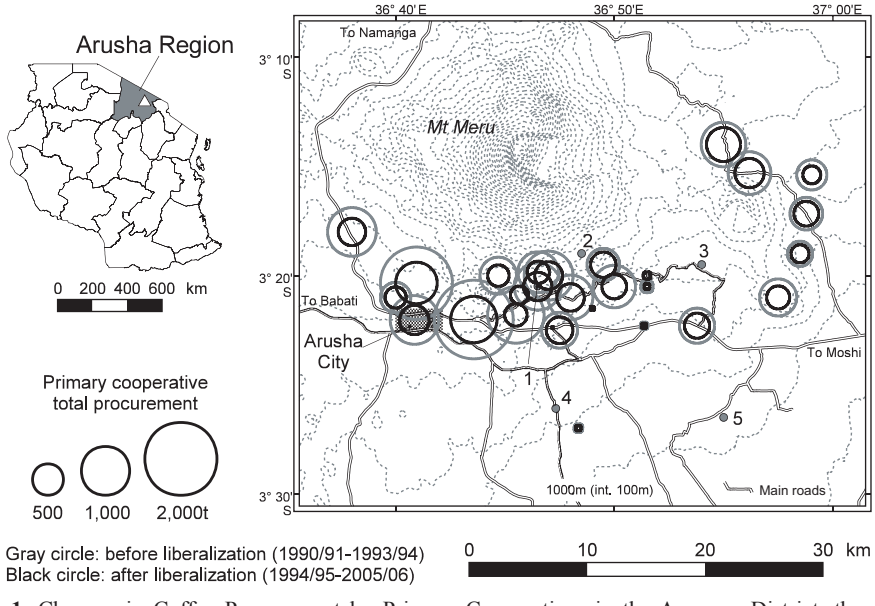

Fig. 1. Changes in Coffee Procurement by Primary Cooperatives in the Arumeru District, the Arusha Region, Tanzania.
Source: Data from the Arusha Cooperative Union.
Note: 1: Akeri, 2: Songoro, 3: Ngurdoto, 4: Mlangarini, 5: Maroroni.

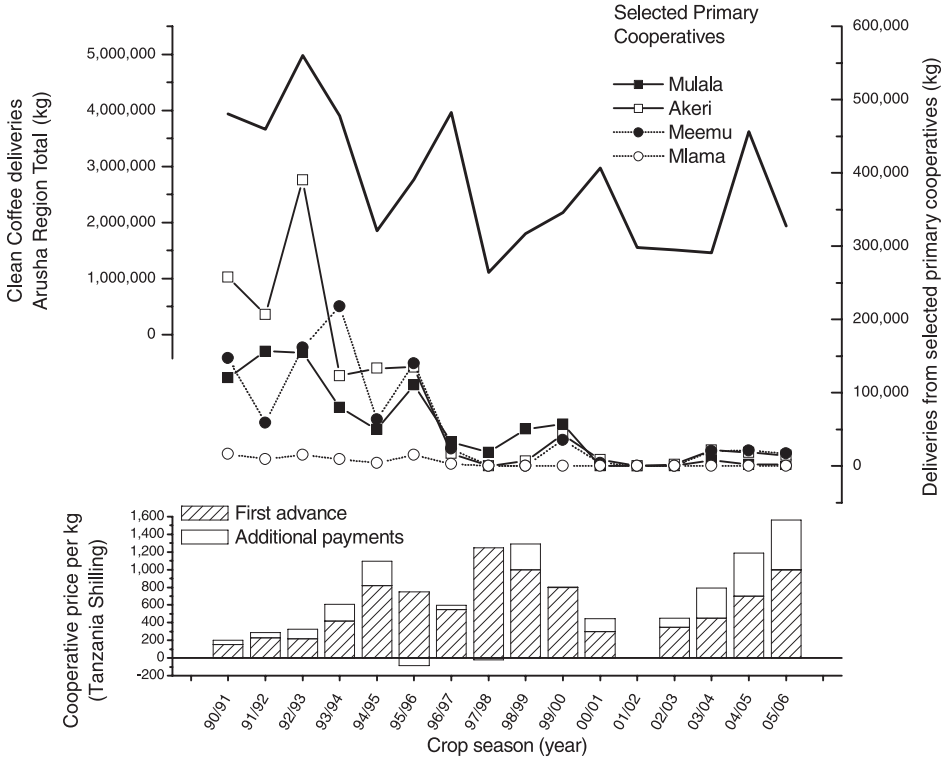

Fig. 2. Coffee Production in the Arusha Region.
Source: 1) Data from the ACU.
2) Coffee production by type and region provided in an electric format by the TCB on August 11, 2006.
Note: 1) The total clean coffee deliveries for the entire Arusha Region include those from large estates.
2) The negative additional payment for the seasons 1995/96 and 1997/98 means that the ACU suffered a financial loss and coffee farmers received the first advance only.

Table 1. Change in Smallholder Coffee Production/Marketing in the Arumeru District by Altitude and Distance from Arusha City.
(A) Annual average (kg) through primary cooperative societies between 1990/91 and 1993/94 (before liberalization).

Altitude	Distance from Arusha City center (west to east)				Total
	Within 9.9 km	10.0 to 19.9 km	20.0 to 29.9 km	30.0 to 39.9 km	
1600 m or above	159,634.3	196,445.0			356,079.3
1500–1599 m	774,287.5	634,286.8			1,408,574.3
1400–1499 m	1,311,317.8	223,380.5		222,227.5	1,756,925.8
Below 1400 m		368,497.5	169,731.5	689,542.5	1,227,771.5
Total	2,245,239.5	1,422,609.8	169,731.5	911,770.0	4,749,350.8

(B) Procurement (kg) in 2005/06 by primary cooperative societies, private buyers, farmers groups and other channels (after liberalization, except direct export).

Altitude	Distance from Arusha City center (west to east)				Total
	Within 9.9 km	10.0 to 19.9 km	20.0 to 29.9 km	30.0 to 39.9 km	
1600 m or above	41,754.0	31,752.0			73,506.0
1500–1599 m	103,614.0	63,402.0			167,016.0
1400–1499 m	63,261.5	17,604.0		82,559.0	163,424.5
Below 1400 m	813.0	28,487.5	51,153.0	332,335.0	412,788.5
Total	209,442.5	141,245.5	51,153.0	414,894.0	816,735.0

(C) The retention index of coffee production/marketing (B/A).

Altitude	Distance from Arusha City center (west to east)				Total
	Within 9.9 km	10.0 to 19.9 km	20.0 to 29.9 km	30.0 to 39.9 km	
1600 m or above	0.26	0.16			0.21
1500–1599 m	0.13	0.10			0.12
1400–1499 m	0.05	0.08		0.37	0.09
Below 1400 m		0.08	0.30	0.48	0.34
Total	0.09	0.10	0.30	0.46	0.17

Source: 1) Data from the Arusha Cooperative Union.
2) Files for licensed private coffee buyers, Idara ya Kilimo na Mifugo, Halmashauri ya Wilaya ya Arumeru.
3) Summary of coffee collected in June 2005 by the Association of Kilimanjaro Specialty Coffee Growers (Kilicafe).
4) Arumeru District Council 2006b. *Taarifa ya utekelezaji kilimo cha kahawa wilayani: Machi*. Afisa Kilimo/Mifugo, unpublished.

Note: A district report records that the total coffee procurement in the smallholder sector of the Arumeru District for the season of 2005/06 was 1,076,778.5 kg (Arumeru, 2006a). By subtracting the following two figures from this total, a possibly more accurate figure, 784,071.5 kg, is obtained. One is 227,185 kg collected by private buyers from large coffee estates, which is known from private buyers' documents, and the other is 65,522 kg bought by farmers groups from outside the district (personal communication at the Department of Agriculture and Livestock, the Arumeru District Council, on August 14, 2006). However, the resultant figure is less than 816,735 kg (B of this table), which the author added up relying on different sources listed above. This last figure is a more plausible total amount for the smallholder sector.

to lower (1499–1400 m and below 1400 m) tiers adjacent to the city of Arusha that accommodates the regional headquarters. Almost all of the index values for these areas are less than 0.10. The local Meru people initially settled in the middle tier in the seventeenth century, and subsequently expanded both upward and downward (Spear, 1997). The middle tier was once the primary coffee production area,

and it is populated with homesteads, or compound farms of relatively intense intercropping of banana (mainly for cooking) and coffee; in addition, stall-feeding livestock are raised and seasonal crops are grown in fields. The lower tier features both indigenous and new (post-independence) villages between large-scale plantations, including coffee estates. The land is used increasingly for seasonal crops and grazing with decreasing elevation. In addition, bananas surround the homesteads where irrigation channels are available, and coffee plants are rare.

Meanwhile, notwithstanding the high cost of transportation, a slightly more moderate decrease in the amount of coffee brought to market has occurred in the upper tier (1600 m or above), whose upper limit borders Arusha National Park and Mountain Forest Reserve (retention index values in Table 1C are 0.26 and 0.16). This zone is peripheral compared to the middle tier, which is the main production area.

Remarkably, the retreat from coffee production in the more remote areas to the east of the city of Arusha has been least pronounced (index values in Table 1C exceed 0.30); these are currently the main production areas, which produced and brought to market 51% (414,894 kg) of the Arumeru District total for the 2005/06 season. A significant feature of these areas is greater performance by private coffee buyers and farmers groups, as well as primary cooperatives (Fig. 3). In particular, TechnoServe has assisted farmers groups in organizing, building infrastructure (e.g., construction of coffee nurseries and mini central pulpers), and marketing, to realize higher prices. The higher retention index for these areas may be partly a result of the combination of relatively recent settlement compared with the former main production areas, moderate ageing of the coffee trees, and a lack of irrigation water for full agricultural diversification.

Nationally, direct exports of mild Arabica totaled 2,721,701 kg in 2004/05, or approximately 9% of total auction sales (28,849,166 kg) and actual shipments (29,614,361 kg) of mild Arabica (source: tables provided by the TCB in August 2006). The national figures for 2005/06 and their geographical breakdown are not readily available. Table 1 and Fig. 3 present data only for those exports sold at the national auctions. As noted above, farmers groups procure a greater share in the eastern region, the current center of production. Some of these groups belong to the AKSCG, which was the first approved direct exporter; roughly 10% of its coffee is sold through direct export (according to the AKSCG's brochure). This figure probably reflects the scale of direct exports from the Arumeru production area, and it is reasonable to assume that the shift in the main production area is a reality, even when direct exports are taken into consideration.

The available data indicate that the smallholder retreat from coffee production has been most significant in the former primary production areas, and that the peripheral areas have not necessarily experienced an intense shift from coffee. It is not always the case that a shift occurs more intensely in peripheral production areas. Thus, the current primary coffee production areas are located in the former peripheral zones.

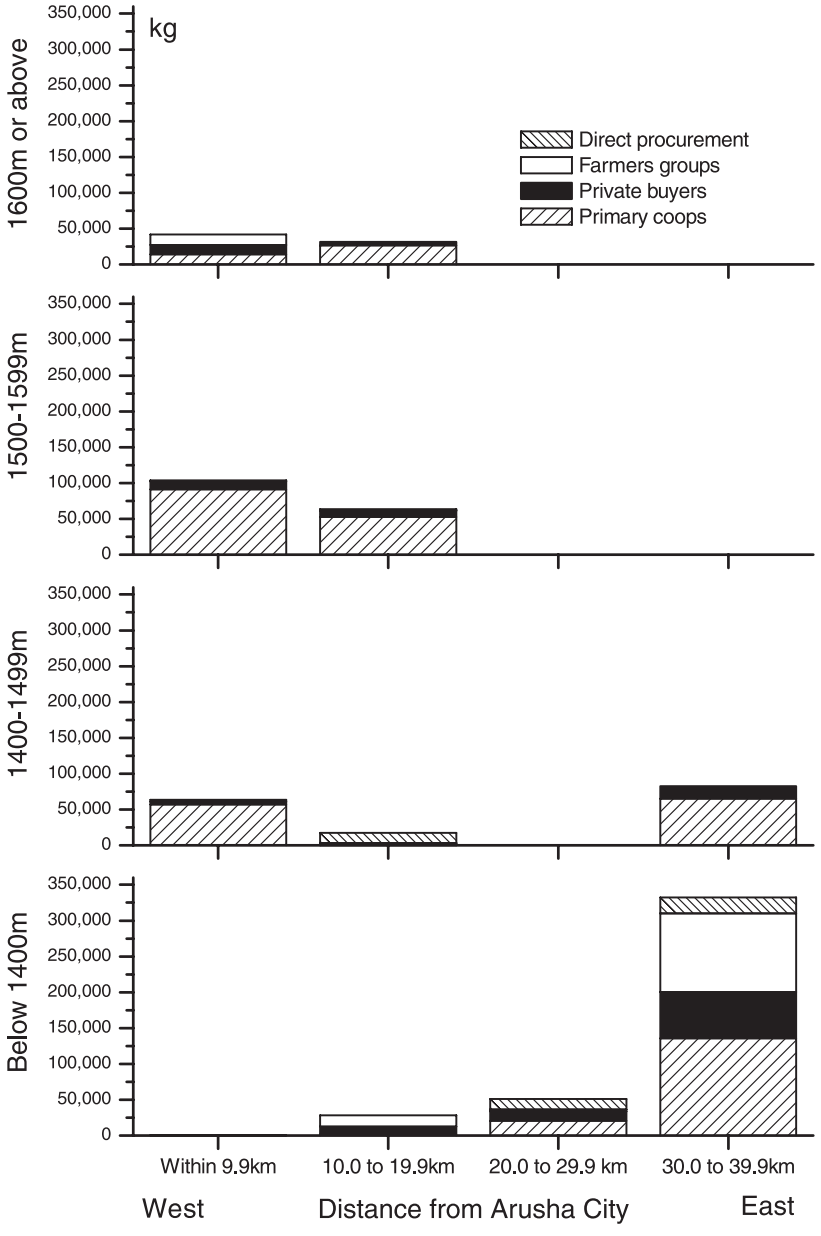

Fig. 3. Different Channels of Coffee Marketing in 2005/06, the Arumeru District by Altitude and Distance from the City of Arusha.
Source: See Table 1.
Note: 'Direct procurement' is the sale by primary cooperative societies and farmers groups with no intervening agency before reaching the national auction.

RETREAT FROM COFFEE PRODUCTION

In this section, the smallholder retreat from coffee is partly substantiated and confirmed at the household level, by inspecting sample data from three village case studies.

I. Sample Households

The following analysis takes a longitudinal approach to analyzing the household economies in the three villages of Songoro, Akeri (Akheri), and Ngurdoto. These villages are located in different production zones, and the samples were originally collected for different purposes (Ueda, 1998, 2000, 2001, 2003). Of the 30 neighboring households chosen in Nkoasakuya, a sub-village of Songoro that comprised approximately 60 households of close kin relations in 1999, 28 were revisited in 2005 and 2006. From the Akeri sub-villages of Maring'a and Nkoamalai, 16 mutually adjacent but not closely related households were selected in 2000; follow-ups of this group were conducted in 2005 and 2006. Although the samples from Songoro and Akeri are acceptably representative of their sub-villages, the non-probabilistic nature of the sampling process did not allow for statistical inference about other parts of the villages. Meanwhile, 19 households in Ngurdoto were chosen randomly from a sample frame of the total 218 households in the sub-village of Kati in 1995, and 17 scattered households were interviewed several times up until 2006. All 61 households were producing coffee when the first fieldwork was conducted, and were expected to have adopted a variety of livelihood strategies.

Located in the upper, peripheral tier (1600 m or above), where the smallholder retreat from coffee production has been relatively moderate, Songoro is at one of the highest altitudes of any of the spontaneous settlements in the Arumeru District. Population censuses reported 1,514 people in Songoro in 1988 (Tanzania, 1991) and 1,485 in 2002 (Tanzania, 2005); thus, the population is approximately stabilized, in contrast to the two lower villages studied. Farmers commonly practice double cropping of maize each year. However, cultivation during the period between February and June, which relies on the long rainy season, is usually not rewarded due to the high altitude and low temperatures; the yield from this planting is frequently used as fodder for livestock. The period between July and February, which spans the dry and short rainy seasons, is therefore important for producing food for human consumption. In addition, Songoro farmers sometimes rely on the temporary "inter-tree planting" of food crops in an adjacent government forest plantation; use of this plantation alleviates land scarcity. Forest officers allow villagers to grow maize, beans, and potatoes, between young tree plants, for about seven years after each initial planting. No irrigation is available.

Akeri is a traditional village situated in the middle tier (1599–1500 m). Its population was 1,413 in 1988 (Tanzania, 1991) and 1,963 in 2002 (Tanzania, 2005); thus, there was a 39% increase in 14 years. Once a part of the primary coffee production region, and relatively close to the main tarmac road to the city

of Arusha, the village is a symbol of the success of the coffee industry. This success is readily visible in its physical infrastructure, which includes permanent building materials and a power grid. However, the village has recently experienced a considerable drop in its coffee production. Banana trees intercropped with coffee dominate the main landscape, and their density is among the highest in the Arumeru District. Access to irrigation systems varies according to topography.

The final village considered, Ngurdoto, is located in the lower, and more peripheral, tier of coffee production (below 1400 m). It was formed by governmental reallocation, when the *Ujamaa* villagization policy was introduced in the mid-1970s, from the formerly European-occupied estate land, and is the newest among the three villages studied. Its population has recently increased by 40%, from 4,649 in 1988 (Tanzania, 1991) to 6,537 in 2002 (Tanzania, 2005). It was one of the largest administrative villages in the Arumeru District before Ngongongare's split from Ngurdoto in 2003. Moreover, this village is special in that it is multi-ethnic. In the selected sub-village of Kati, double cropping of maize is common, and the precipitation of the long rainy season is usually sufficient to yield a reasonable harvest. The triple cropping of beans, intercropped with maize, can also be observed. Most households in this sub-village have no access to irrigation channels, and rain-fed farming is dominant.

Table 2. Sample Household Characteristics, August 2006 (Mean Values for the Sample Households).

Village	Songoro	Akeri	Ngurdoto
Number of the sample households	28	16	17
Age of the household head (years)	57.4	59.6	53.5
Number of years in education: household head	6.3	8.2	6.5
Household size[1]	5.7	6.3	9.4
AEU (adult equivalent units): all members[2]	4.1	4.5	6.8
AEU: non-residents[2]	0.9	0.5	1.3
Land owned (acre)	3.3	3.1	2.3
Area farmed (acre)	3.5	3.4	2.6
Land owned per capita (acre)[3]	0.78	0.66	0.30
Area farmed per capita (acre)[3]	0.80	0.69	0.33
Livestock (CEU: cattle equivalent units)[4]	3.0	3.7	2.1
Cattle owned (no.)	3.3	3.9	1.1
Electricity (national grid, solar and generator) %	7.1	68.8	5.9
Piped water %	46.4	81.3	5.9
House materials: concrete floor, concrete wall %	32.1	87.5	11.8
Number of rooms	4.2	4.9	2.9

Source: Fieldwork by the author in August 2006.

Note: [1] Includes school-attending, remitting, and self-supporting children before marriage living elsewhere.

[2] AEU: Youth (aged between 12 and 16) counted as 2/3 of adult. Those aged below 12 are excluded.

[3] Includes school-attending children and remitting children living elsewhere, but excludes self-supporting and non-remitting children living elsewhere.

[4] CEU: cattle=1.00, calf=0.43, goats=0.25, sheep=0.10, chicken=0.02. Based on average price ratio.

As Table 2 indicates, the sample households from Ngurdoto are younger, have more members and labor force participants than sample households from the other two villages. However, the amount of land that they own and cultivate is smaller, and the per capita figures in this regard increase as one moves up the slope of Mount Meru. This transition is a reflection of the spatial variation of the population increase, as evidenced by census figures. Accordingly, more members are non-residents in Ngurdoto. Moreover, the households in this village have less livestock and infrastructure than those in Songoro and Akeri.

II. Production and Conversion

The coffee data from the three villages only span the post-liberalization era (Tables 3 and 4). Villages located in the current primary production area, namely the lower and more remote areas (below 1400 m, and 30.0–39.9 km east of Arusha city center), have yet to be investigated. Nevertheless, the picture derived from the following examination of household data agrees with the pattern of spatial variation in the retreat from coffee production discussed in the previous section.

With its almost stabilized population, the sample from Songoro in the upper tier (10.0–19.9 km east of Arusha city center, with a retention index value of 0.16) for the seasons 1998/99 to 2005/06 collectively maintained a moderate production level (Table 3). Moreover, the conversion of coffee farms to other agricultural uses was less prevalent there than in the other two villages (Table 4). Although the village is located in a peripheral production area, its sample households generally have maintained the level of coffee production. Of the 15 land

Table 3. Coffee Production and Marketing: Total Amount of Marketed Parchment Coffee (kg): the Sample Households of the Three Villages in the Arumeru District.

Village	N of sample	Year								
		1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000	...	2004/05	2005/06
Songoro	28					1,850.6			1,700.2	1,780.6
Akeri	16						5,595.0		3,406.0	2,942.0
Ngurdoto	17	432.5	1,843.5	670.0	173.0				645.5	240.5

Source: Fieldwork by the author in 1995, 1996, 1998, 1999, 2000, 2005 and 2006.
Note: Data are not collected for the blank parts of the table.

Table 4. Crop Change in Former Coffee Farms: the Sample Households of the Three Villages in the Arumeru District.

Village	N of sample	Acreage			Conversion ratio (B/A)
		A: Initial	B: Converted	Current (Aug. 2006)	
Songoro	27	20.75	4.00	16.75	0.19
Akeri	16	23.00	7.00	16.00	0.30
Ngurdoto	16	14.75	6.75	8.00	0.46

Source: Fieldwork by the author in 1995, 1996, 1998, 1999, 2000, 2005 and 2006.
Note: The crop change includes complete uprooting and withering of coffee trees.

purchases made since 1999, three were of coffee plots; moreover, the prices obtained for these plots were substantially higher than those for similarly sized open fields for seasonal crops. This price difference indicates the continuing importance of coffee trees for at least some buyers.

The Mulala Rural Cooperative Society serves Songoro and the villages of Kilinga and Mulala. Since 1969, it has managed a central pulpery for primary processing, which has helped farmers produce high-quality parchment coffee, and overcome transportation disadvantages associated with being located in the upper tier (Photo 2-1). It is an exception to most domestic and individual processing facilities by smallholders, and its history demonstrates the importance of coffee production to the people in this area, despite the fact that the amount procured by the Society has been decreasing considerably. Moreover, some people in this upper tier have begun to organize themselves into a new farmers group to sell their coffee to a vertically integrated exporter with its own central pulpery in the village of Nkoanekoli. This pulpery is located at the same altitude as the Mulala central pulpery (Photo 2-2). In general, these producers have tended to sell their coffee unprocessed, to avoid uncompensated labor when faced with low market prices.

In contrast, for the seasons from 1997/98 to 2005/06, the sample households in Akeri, which lies in the middle tier (10.0–19.9 km east of Arusha city center, retention index value of 0.10), experienced a large drop in the total amount of coffee brought to market through their primary cooperative or private buyers. This decrease occurred even though coffee production in this village has been the highest of the three (Table 3). These farmers more intensely cleared their land of coffee trees to, for example, establish themselves in commercial horticulture (Table 4). Informal interviews revealed that the younger generations who inherited the subdivided homesteads of coffee and banana from their fathers tended to uproot their coffee trees to build houses as a consequence of heavy population pressure. This has been cited as one cause of the decline in coffee production.

In the lower-tier village of Ngurdoto (20.0–29.9 km east of Arusha city center, retention index value of 0.30), for the period from 1994/95 to 2005/06, coffee trees were neglected and the amount produced and marketed has continued to be very small (Table 3), even in the presence of the Meemu Rural Cooperative Society and other farmers groups, which serve as marketing channels. This has been particularly true where irrigation water has not been available: this is the case of the selected sub-village. Otherwise, the coffee farms (intercropped with bananas and other crops) have been converted to other agricultural uses to a great degree (Table 4). The relatively high retention ratio for this village derives from the continued low level of production.

III. Age of the Head of the Household

Because of the nature of the research methodology employed (longitudinal follow-up), younger households tended to be increasingly underrepresented in time. Nevertheless, the data are still useful for understanding changes in coffee production and livelihood strategies in the study area, because the annual coffee pro-

duction records for various market channels, even for the recent past, are in many cases absent at the household level. However, the following analysis briefly addresses the effect of age, to determine whether the inclusion of younger generations in the analysis would have changed the overall picture.

The correlation between the age of the household head and the scale of coffee production for 2005/06 is positive (r=0.28) when computed for the entire sample. By village, however, this positive relationship is stronger for Akeri (0.57) and Ngurdoto (0.41), suggesting that the scale of coffee production has been smaller for younger households in villages located in the middle and lower tiers. In contrast, this correlation of the households in Songoro is weakly negative (−0.15); for this village in the upper tier, the production scale varies regardless of the age of the household head, and it may even be slightly higher for younger generations. Meanwhile, the relationship between household head age and the coffee conversion ratio (see Table 4) for the 59 households of the three villages is almost non-existent (r=−0.06), and the correlations by village are also very small (0.00 for Songoro, 0.04 for Ngurdoto, and −0.18 for Akeri). Thus, there was a slight tendency for older households in Akeri to retain and produce more coffee. If coffee trees were counted, a stronger relationship might be revealed between coffee production and the age of the head of the household.

Although younger generations are underrepresented in the sample, their retreat from coffee production may have been more intense in Akeri, but less significant in Songoro, and their inclusion in the foregoing analysis might confirm the earlier findings. Meanwhile, the incorporation of younger households from Ngurdoto might lower its moderate retention ratio (at minimal production scale) and, therefore, slightly alter the overall pattern of spatial variation.

LIVELIHOOD STRATEGIES AND STRATIFICATION

As the foregoing analysis has shown, the sample households from the three villages reflect, to a great extent, the entire spatial variation pattern of the retreat from coffee production in Arumeru. Therefore, the data from these villages can be analyzed accordingly. It has also been suggested that population pressure may be one factor that has motivated the conversion of coffee farms and has, thus, resulted in declining or low-level coffee production. In this section, an examination of the livelihoods of the sample households is presented, with special attention to their comparative net income portfolios. The aim is to measure the relative importance of coffee production to the household economy, identify the areal differentiation of livelihood strategies, and examine the relationships between livelihood strategies and net income levels, indicating relatively successful livelihood strategies, in different geographical settings.

I. Methods

In the following analysis, the total annual net income for a household is calculated by subtracting monetary costs (excluding unpaid family labor) from the

value of total production, which is evaluated based on the average market prices of the relevant products for each village. The data from the 61 households span the 12 months prior to the fieldwork that took place in August 2006; that is, the data cover the period from August 2005 to July 2006.

In this study, the production aspect of the household economy is divided into six sectors: "coffee," comprising all coffee-related activities; "staple crops," including maize, beans, bananas, potatoes, and cassava; "vegetable," consisting of horticultural activities, as well as the gathering and domestication of wild vegetables; "livestock," concerning the production of cattle, goats, sheep, poultry, including milk and eggs, based on changes in monthly production levels (however, goat milk is excluded, and thus net income from livestock, particularly in Ngurdoto, where dairy cattle are rare, may be underestimated); "other agro-natural extraction," the main component of which is firewood, log, and timber harvesting, though in some cases also including the gathering of fruit from trees within a farm; and "non-farm activities," comprising self-employment in small-scale commerce and manufacturing, temporary employment of various kinds, and more formal salaried employment. This final sector does not include temporary agricultural work on the land of others, because most household respondents claimed that they did not work for others due to an insufficient labor force on their own land. However, the reality may be somewhat different. The income generated from illicit activities may not be fully reflected in the data. Five land transactions, all of which took place in Songoro, are excluded from the analysis.

This study does not apply the matching principle of accounting when calculating net income because of the difficulty in matching the subsequent parts of the annual costs of a particular product with their corresponding revenues that might partly be collected in the future. Consequently, the calculation allows the annual net income to be negative; this sometimes occurs in the perennial coffee and livestock sectors, for example, and small or negative numbers do not necessarily imply that the relevant sector is an insignificant contributor to a household's livelihood. Meanwhile, many of the households studied experienced a bad harvest during the research period due to drought or inadequate rainfall. This may render the net income estimation for the period somewhat unusual.

II. Average Livelihood Components

Table 5 summarizes the average composition of annual net income by sector. For all three villages, coffee is only slightly significant in the household economy, in both absolute and relative terms, regardless of how important it may have been for material well-being in the past. It is not a major factor of socioeconomic differentiation among the sample households. The very small contribution of coffee to total net income in 1997 has also been explored for the Hai District of the Kilimanjaro Region, which is the primary production area in northeastern Tanzania (Ellis, 2000: 211).

Differences in asset accumulation across the three villages (Table 2) are translated into the absolute annual net income differences in Table 5. In per capita terms, the Akeri households earned more than twice as much as those in Son-

Table 5. Annual Net Income in 2005/06: the Sample Household Mean Values of the Three Villages in the Arumeru District.

Village	Songoro	Akeri	Ngurdoto
Number of sample households	28	16	17
[TShs]			
Coffee	53,278	186,278	10,865
Coffee production (parchment coffee equivalent) 2005/06 (kg)	*63.6*	*183.9*	*14.1*
Staples*	177,090	1,132,278	208,872
Vegetables	39,854	83,056	1,724
Livestock	256,279	556,775	59,663
Other agro-natural extraction	114,214	636,708	93,612
Non-farm activities	388,393	691,813	384,069
Total	1,029,108	3,286,908	758,805
Net income per capita**	218,432	563,281	95,814
[%]			
Coffee	7.4	2.9	2.5
Staples*	23.1	36.3	41.8
of which maize	*8.9*	*2.3*	*18.0*
various bananas (mainly for cooking)	*8.4*	*31.4*	*16.9*
Vegetables	4.2	9.2	0.0
Livestock	19.5	16.6	2.1
Other agro-natural extraction	17.7	17.1	30.0
Non-farm activities	28.2	17.9	23.6
Total	100.1	100.0	100.0
[Consumption]			
Output share consumed by household (except non-farm income) %	51.3	48.2	79.8
Share of subsistence consumption to net total income %	56.7	51.5	63.9

Source: Fieldwork by the author in August 2006.
Note: * Maize, beans, banana (mainly for cooking), and cassava.
** Includes school-attending children and remitting children living elsewhere, but excludes self-supporting and non-remitting children living elsewhere.
The exchange rate was TShs. 1,290=US$ 1.00 in August 2006.

goro, and nearly six times as much as those in Ngurdoto, during the sample period. Located within the once-primary coffee production area, the average net income of these households from coffee has been considerably greater than that of the others, even after a significant decline, as discussed in the previous section. However, the contribution of coffee income to the total has been trivial. Akeri's economic superiority is also expressed in other sectors where all figures exceed those for the other two villages. The Songoro households follow those of Akeri and have greater income for all sectors (except "staple crops") than those in Ngurdoto.

As Table 5 illustrates in relative terms, the single most important produce for the Akeri households has been a variety of bananas, and their denser homestead plantation is a visible expression of their material well-being, regardless of the coffee trees planted in-between. This feature is relatively more salient for Akeri than for the other two villages. The market price of a bunch of bananas of the same variety also tends to be higher in Akeri. Moreover, the significance of the

livestock sector for households in both Akeri and Songoro has widened the net income gap between these and the Ngurdoto households. This calculation is likely to be robust to the inclusion of goat milk, because of the relatively few cattle equivalent units of the Ngurdoto households (Table 2). In addition, a minor but important difference can be seen for the vegetable sector, where the Akeri households earn much more than their counterparts elsewhere. The share of the vegetable sector surpasses that of coffee, and this may, in part, be a direct consequence of crop shifts away from coffee (Table 4). All of these differences emphasize the large contribution of the staple crops sector, especially maize, in Ngurdoto, as well as of other agro-natural extraction. Although it is impossible to compare the absolute volumes of wood resources collected among the three villages, a large share in Ngurdoto may inevitably result from the low net total incomes of the inhabitants because firewood is more or less indispensable regardless of their socioeconomic status. Finally, the relative contribution of non-farm activities is accordingly greater in both Ngurdoto and Songoro. It is slightly less significant in Akeri. Overall, therefore, the degree of de-agrarianization has been, on average, less than or equal to that of the three coffee-producing villages in the Kilimanjaro Region studied by Ellis in 1997 (2000: 211).

Wide income gaps among the three villages are also apparent in a different way (Table 5). The Ngurdoto households consume significantly more for subsistence and attribute a higher share of their subsistence consumption to their net total incomes than do those in Akeri and Songoro. This result highlights the contrast between the low-income subsistence economy of Ngurdoto and the better-off, surplus-generating and monetized economies of Akeri and Songoro.

III. Areal Differentiation of Livelihood Strategies

As a means of identifying the various livelihood strategies and capturing the extent of their areal differentiation in the Arumeru coffee production area, the 61 sample households from Songoro, Akeri, and Ngurdoto are classified into distinct groups with reference to the sectoral composition (in percentages) of their annual net total incomes, or net income portfolios. This classification is performed using cluster analysis (standardized data, square Euclidean measure, and Ward's method). Two outliers are excluded from the analysis and are treated separately. An inspection of the fusion coefficient in the analysis reveals a large jump in its value (information loss) when five clusters are agglomerated from the six obtained at the immediately previous stage. Thus, the optimal number of clusters for this analysis appears to be six. The upper section of Table 6 presents the average percentages for the six activity sectors of the six clusters. In other words, these clusters represent the six different livelihood strategies. The average age of the household head for each cluster is shown in the middle section. The lower section of the table cross-tabulates cluster membership by village and by income stratum, divided by the three quartiles of the distribution of annual net total income per capita for the 61 cases.

As indicated vertically in Table 6, the 12 households classified into Cluster 1 are characterized by an above-average percentage contribution of the livestock

Table 6. Classification of Livelihood Strategies in the Three Villages in the Arumeru District, 2005/06.

	Cluster average (%)						Total average	Outliers average
	1	2	3	4	5	6		
Coffee	0.4	6.3	−3.3	0.8	13.9	3.1	4.2	22.8
Staples	30.7	66.5	37.4	18.2	23.5	29.6	30.8	61.2
Vegetables	6.1	1.1	55.8	1.5	3.9	3.5	4.0	14.3
Livestock	41.7	−0.6	1.2	9.7	25.7	1.0	16.4	−61.3
Other agro-natural extraction	13.5	21.2	0.0	13.0	12.2	59.6	19.5	62.9
Non-farm activities	7.6	5.4	8.9	56.7	20.8	3.2	25.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average age of the household head (year)	63.8	59.0	71.0	49.4	57.1	59.9	56.8	56.9

[Number of households]		Cluster						Total	Outliers
Village	Income strata*	1	2	3	4	5	6		
Songoro	4				3	1		4	
	3	4			5	5		14	
	2		1		1	3	1	6	
	1	1				1		2	2
Akeri	4	2	1	1	2	1	2	9	
	3				1			1	
	2	5	1					6	
	1							0	
Ngurdoto	4				1		1	2	
	3				1			1	
	2		1		2			3	
	1		5		3		3	11	
Total		12	9	1	19	11	7	59	2

Source: Fieldwork by the author in August 2006.
Note: * Net income strata by quartiles (per capita): TShs.
4: 331,089.2<income
3: 169,772<income<=331,089.2
2: 68,539.74<income<=169,772
1: income<=68,539.74

sector to their annual net total incomes. They are also characterized by a higher, but nonetheless miniscule, contribution by the vegetable sector, including domestication of wild vegetables especially in the case of Songoro. The net income strata of the member households are mixed, and no clear association between membership in this cluster and higher economic well-being is observable. In contrast, Cluster 2 exhibits the highest reliance on staple crops and includes nine households, eight of which are rated relatively low in terms of their net per capita income, despite the above-average influence of coffee in this cluster. Cluster 3 comprises a single Akeri household with an extraordinarily high dependence on the vegetable sector and belonging to the highest income stratum. Meanwhile, 19 households are grouped into Cluster 4, which shows the largest average proportion of non-farm activities. Of all the livelihood strategies, this one involves the highest degree of de-agrarianization. This cluster is the largest group within

the set of 61 households, and the majority (13) of the households in this cluster also fall into the upper two income strata. This relationship indicates the importance of non-farm activities to the achievement of higher socioeconomic status. However, the remaining six households in this cluster are below the average income level, thus suggesting that the de-agrarianization is a stratified process.

The 11 households in Cluster 5 are most reliant on the coffee sector, although their dependence on the livestock sector is also above average. More than half (seven) of the members belong to the upper two economic strata, and their economic well-being is associated positively with this balanced income portfolio, or livelihood strategy. Finally, Cluster 6, a minority with its seven member households, relies on the other agro-natural extraction sector. The households in this cluster are of mixed socioeconomic status, because it consists of two distinct groups of households. These groups include the firewood-collecting subsistence households and the log/timber-selling households who participate in the cash economy. In addition, two extraordinary cases constitute outliers, because the measured figures of the livestock sector for them are largely negative. As explained earlier, net income is subject to annual variability, and negative figures should not be regarded as permanent, especially in the case of livestock production.

The average age of the household head (Table 6) for the largest cluster (Cluster 4), which engages mainly in non-farm activities, is the lowest by a wide margin. This suggests that younger households tend to diversify into non-agricultural activities to a greater extent, and minimize the contribution of coffee production. Cluster 5, which also relies to a relatively large extent on non-farm activities, is the second youngest; however, this group is also the most reliant on coffee production. The remaining clusters are older, but exhibit no straightforward association between income portfolio and average age of household head.

As the foregoing analysis has revealed, the livelihood strategy adopted is not necessarily associated with a specific net per capita income stratum. However, relying primarily on staple crops (Cluster 2) leads to lower income, while non-farm activities (Cluster 4) or a balanced (Cluster 5) portfolio result in higher income. In particular, primary reliance on non-farm activities is associated with younger generations, which sheds light on one aspect of the de-agrarianization process among the sample households, as well as its economically stratifying nature.

An inspection of the village-level information in Table 6 reveals that the relationships between the livelihood strategies and the net income levels differ according to geographical setting. In Songoro, most of the households in the upper two income strata rely on livestock (Cluster 1), non-farm activities (Cluster 4), or maintaining a balanced portfolio (Cluster 5); the lower two strata comprise a minority. This pattern suggests that these three livelihood strategies are important for socioeconomic improvements in a village located in the upper tier of the Arumeru coffee production area. For Akeri, which is located in the middle tier, the economic well-being of the sample households is positively associated with all six livelihood strategies. This result is indicated by the figures for Stratum 4, which spread from Cluster 1 to 6. Akeri's more favorable location adjacent to the city of Arusha, where relatively more opportunities are available for selling

agricultural commodities and finding non-farm employment, may be important factors. On the other hand, the sample households in Ngurdoto in the lower tier are, on the whole, the poorest among those in the three case villages. The low socioeconomic status of these groups therefore relates to the three livelihood strategies that are based on staple crop production (Cluster 2), non-farm activity (Cluster 4), and other agro-natural extraction (Cluster 6), respectively.

THE CROSS-SECTORAL REPERCUSSIONS OF LIBERALIZATION WITHIN THE REGIONAL SYSTEM

A deeper look into the livelihood strategies that are prevalent in different villages suggests that several factors lie behind both their popularity and the related changes in the level of coffee production. These factors include village location and environment, the extent of village interdependence, and the cross-sectoral impacts of liberalization within the regional system that accommodates the vitalized urban economy. In this section, special emphasis is placed on two important contributors to the areal differentiation of livelihood strategy incidence: irrigated horticulture and dairy production. The availability of such opportunities has conditioned smallholder livelihood diversification choices under liberalization. Not all aspects of the areal differentiation can be explained solely by the liberalization impacts. What this section emphasizes, however, is the significant role of the geographical factors in mediating the macroeconomic changes.

I. Opportunities for Horticulture

The mining (tanzanite) boom that occurred in the Mererani area (900–1000 m asl., 40 km southeast of Arusha) located in the adjacent Simanjiro District of the Manyara Region (Fig. 4), and the thriving international tourism in northern Tanzania that began after economic liberalization (Wangwe *et al.*, 1998: 67), resulted in a growing demand for horticultural produce within the regional system on the flanks of Mount Meru, which is centered on the city of Arusha and the mining town of Mererani (Ueda, 2003). The surrounding villages responded in various ways to this stimulus, depending on the availability of irrigation and their capacity to sustain year-round horticulture. This differential response was one repercussion of liberalization, which had different influences on locations with distinct environments in the regional system.

Of the 104 villages located below 1600 m, the majority (60) have irrigation channels (Fig. 4). Of the 36 villages located at 1600 m or above, however, only eight have access to irrigation water; the remaining 28 do not. In addition, the agricultural climate of the upper tier does not allow the people to practice year-round commercial horticulture, which has led to their dependence on small-scale dairy production, the recurrence and sale of traditional wild vegetables, such as *mnavu* (*Solanum nigrum*), and at least partly on coffee production. It has also led to an increase in the importance of non-farm activities as a means of securing cash income. This is exactly what happened in Songoro, and it explains the

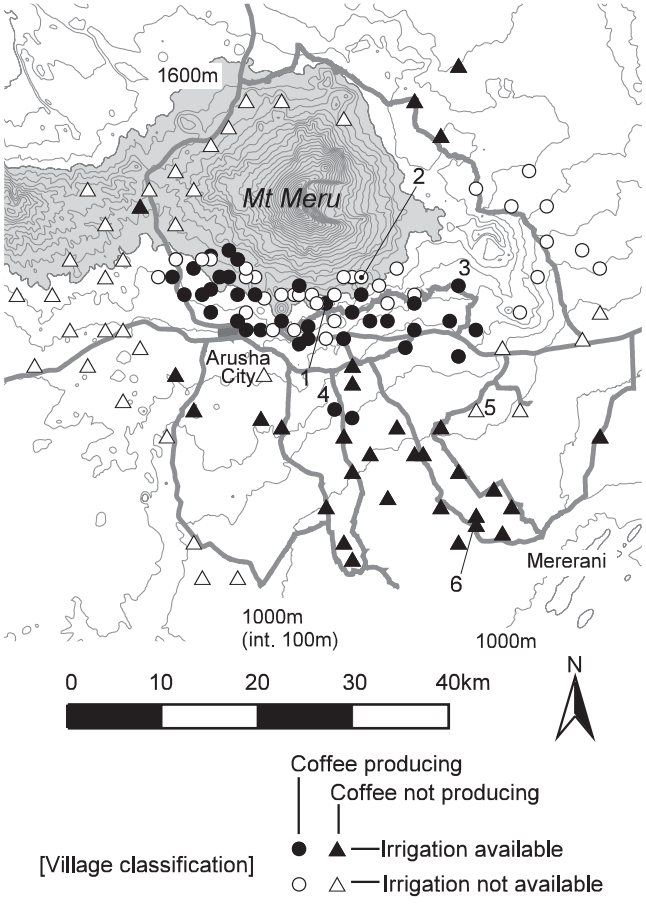

Fig. 4. Irrigation and Coffee Production in all Administrative Villages in the Arumeru District.
Source: Fieldwork by the author and various sources from the Arumeru District Council.
Note: 1: Akeri, 2: Songoro, 3: Ngurdoto, 4: Mlangarini, 5: Maroroni, 6: Mbuguni

reliance of its higher-income households on the three livelihood strategies identified in the previous section (Cluster 1, 4 and 5 in Table 6). The same irrigation availability problem also applies to the current primary coffee production area located 30.0–39.9 km east of Arusha.

If irrigation or piped water is available and well maintained, the associated decline in coffee production can be substantial. Although the whole spectrum of livelihood strategies is associated with higher incomes among the sample households in Akeri (Table 6), those with access to water do practice irrigated horticulture. Former coffee plots have been converted to horticultural use, in some cases after the soil has been improved with organic manure (Photo 2-3 & 2-4). According to a local newspaper, the farmers are now aware that they should practice organic farming (*kilimo hai*) for horticultural produce, to compete in the international market (‘Local vegetable farmers face market hurdles,’ *Arusha Times*, July 23–29, 2005). The sample households from Ngurdoto are the least fortunate, as no

irrigation is available in their sub-village and their coffee production level has long been minimal. Therefore, these villagers have had no other choice than to produce staple crops, engage in non-farm activities, and perform other agro-natural extraction, as illustrated in the previous section (Cluster 2, 4 and 6 in Table 6).

The village of Mlangarini, another example, also experienced a drastic retreat from coffee production (Fig. 4: below 1400 m, 10.0–19.9 km east of Arusha city center). Such a change should be expected from the very low coffee retention index of the area (0.08). Its population increased by 48% from 2,787 in 1988 (Tanzania, 1991) to 4,112 in 2002 (Tanzania, 2005), an enormous increase.

In Mlangarini, smallholders started planting coffee trees in the early 1970s by making use of a small-scale irrigation system (unlined and gravity-fed). In addition, they, with farmers in the adjacent Manyire Village, organized themselves into the Mlama Rural Cooperative Society. Since then, production has been on a small scale, with procurement per member per year ranging between 23 and 196 kg (from 1989/90 to 1996/97). The cooperative, which had no central pulpery, was the smallest constituent of the ACU in terms of the amount procured. After liberalization of the coffee market, most producers sold their produce individually to private companies, and the cooperative forwarded its last produce to the ACU in 1996/97.

On the whole, however, of the 133 households that have maintained the indigenous irrigation system in Bondeni, a sub-village of Mlangarini, 103 have never planted coffee trees as a cash crop, and it is noteworthy that most coffee pro-

Table 7. Coffee Tree Ownership, Bondeni Irrigation Channel, Mlangarini (the Arumeru District, March 2005).

	Household	%
Yes	7	5.3
Uprooted	23	17.3
No	103	77.4
Total	133	100.0

Source: Fieldwork by the author in March 2005.

Table 8. Crops in Irrigated Fields, Bondeni Irrigation Channel, Mlangarini (the Arumeru District, February 21–March 6, 2005).

Crops	Case	%
Tomato	66	43.1
Other vegetables	19	12.4
Maize	24	15.7
Banana	21	13.7
Cassava	1	0.7
Coffee	1	0.7
No plant	2	1.3
No irrigation	19	12.4
Total	153	100.0

Source: Fieldwork by the author in March 2005.
Note: The total number of cases is not equal to the total figure of households (133) that use the irrigation channel, as some households irrigate their field for plural crops.

ducers had uprooted their trees by 1999 or 2000 (Table 7). Common reasons for discarding the coffee trees included low producer prices, a shortage of agricultural inputs, and a shift (conversion of the former coffee field) to vegetables that grow rapidly and can be converted to cash throughout the year. This last reason is consistent with the suggestion that smallholders have tended to shift from "slow" to "fast" crop cultivation under the agricultural commercialization that resulted from economic liberalization. At the same time, dry-season irrigation agriculture in Bondeni, Mlangarini, in 2005 largely consisted of vegetable cultivation (Table 8). Because of the tight irrigation acreage limits imposed by the water distribution schedule, which is controlled by the eight water-user sub-groups in the sub-village under consideration, irrigation horticulture appears to be a subsistence-supporting activity in most cases, even though it provides a relatively easy means of obtaining cash income. Although horticulture has not yet surpassed other livelihood activities, it is clear that it has become an alternative to coffee as an income source.

II. Opportunities for Dairy Production

In the villages located in the semi-arid plain below the lower coffee production tier, crop residues (the stems and leaves of maize and bean plants, among others) have been commoditized as fodder since the beginning of the 1990s as a result of population increases and a subsequent shortage of rangeland. Meanwhile, the economic liberalization stimulated mining activities and the consequent commercial irrigation of food crops; these changes resulted in an increasing surplus of fodder, as well as a growing demand for milk consumption, in the lower plain. An increase in the demand for dairy produce also resulted from an increase in international tourism within the regional system (Ueda, 2001, 2003).

The villages again responded differently to changes in supply and demand. These varied responses, a further repercussion of liberalization, were determined this time by the relative ease of transport. The upper tier has had difficulty in larger-scale fodder importation and milk production, and falls outside of the milk collection sphere of commercial creameries. Thus, this zone tends to rely on other sources of cash income, including coffee production. This is the case for Songoro, in particular (Cluster 1, 4 and 5 in Table 6). Although many of the sample households in Songoro own land on the northern flank of Mount Meru, most of this land has been cultivated by their relatives: they do not provide crop residues as fodder for their Songoro households (Fig. 5). Even though raising livestock as a livelihood strategy is one choice for the sample households, the relatively moderate net income level that it provides implies that it is more a means of subsistence than of wealth accumulation (Table 5).

The households in the middle tier, including those in Akeri, are relatively free from the transport constraint. They import fodder from lower areas for the purpose of rearing dairy cattle (Photo 2-5). Moreover, fieldwork in Maroroni (Ueda, 2000), one of the villages located in the lower plain, revealed that those households in the villages adjacent to Akeri also lease land there from which they can obtain crop residues for fodder (Fig. 5). These households are more inclined to

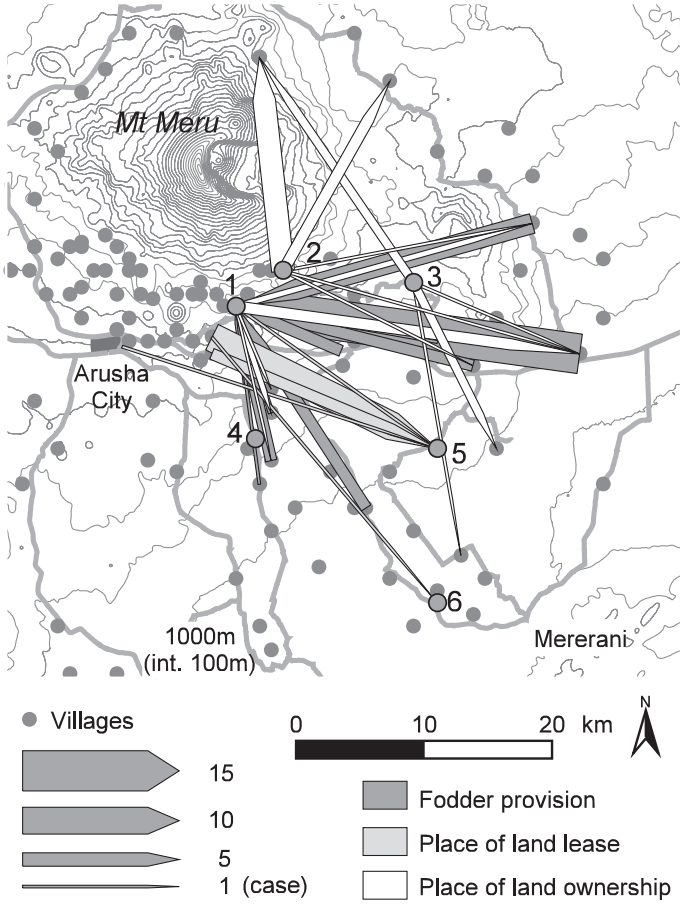

Fig. 5. Inter-village Relationships of Fodder and Farmland Provision.
Source: Fieldwork by the author.
Note: The figure indicates the number of observed cases among the sample households in the following five villages, where fodder was exported or farmland was provided for/by households located elsewhere. Absence of arrows signifies no relevant flows.
1: Akeri (16 households, August 2000), 2: Songoro (29 households, August 1999 and 2000), 3: Ngurdoto (32 households, August 1998), 4: Mlangarini (no data), 5: Maroroni (28 households, July 1998), 6: Mbuguni (29 households, August 2001).

shift to livestock production on the basis of inter-village fodder production and trade relationships, and this pattern stimulates the regional economy. The inhabitants of Akeri have access to electricity, and commercial creameries are allowed to purchase power for their milk storage station; the situation in the upper tier is not comparable. Accordingly, many Akeri households have chosen to raise livestock, which has intensified both agriculture and livelihood diversification in the middle tier (Table 5). The newly created inter-village fodder trade system and its mediation network have sustained their activities. In Ngurdoto, in the lower tier, dairy cattle are rarely raised, and milk production occurs only at the subsistence level (Table 5). The local inhabitants have no other choice but to rely on

the production of staple crops, non-farm activities, and other agro-natural extraction (Cluster 2, 4 and 6 in Table 6).

However, the transport constraint has by no means been decisive in all cases, as the same liberalization process has resulted in the emergence of a small minority of milk-processing households in the upper tier (Ueda, 2001). Locally, most milk is consumed without being processed. Since the beginning of the 1990s, however, the increase in international tourism has stimulated small-scale milk-processing activities that transform milk into value-added forms that are lighter and have a longer shelf life, such as cheese. Producers have adopted this strategy to overcome their unfavorable location in the upper tier, facilitate produce transportation, and earn income at a level well above subsistence. In Songoro and its environs, four micro-enterprises were operating in 2000. They made Gouda cheese, cream, and butter using imported essential equipment and rennet (Photo 2-6). The operators, a husband and wife, of two relatively well-equipped enterprises had public-sector employment experience, which enabled them to acquire the necessary knowledge and skills, and even invest in a refrigerator that runs on biogas. These two agro-processing enterprises bought and processed milk from the neighboring farmers, in addition to processing their own. They also relied on the fodder surplus in the lower areas, which suggests that their income from milk processing typically surpassed the cost of fodder transportation, in spite of their location. Their customers were supermarkets and hotels located mainly in the city of Arusha, and their monthly cheese production for these two groups of customers (July 2000) was evaluated at approximately TShs 1,560,000 and 1,990,000, respectively. Subtracting only the cost of milk, their gross incomes can be calculated at about TShs. 780,000 and 1,000,000. This is an extraordinary scale of monthly production when compared to that of the other livelihood strategies evaluated in Table 5.

These special cases suggest that the location and environment of a village may not always determine which livelihood strategy is chosen. Moreover, non-farm employment, in the public sector in the above cases, may not necessarily result in the irreversible process of de-agrarianization. However, the livelihood strategy selected by ordinary households depends on their location, village environment, and inter-village relationships, as well as the cross-sectoral impact of liberalization on the regional system.

CONCLUSION

In the coffee production area of Arumeru, the smallholder retreat from coffee has been most significant in the former production center, which is located at an intermediate elevation near the city of Arusha. Primary coffee production has shifted into former peripheral areas at lower altitudes. This overall trend in production decline has been substantiated at the household level. The Songoro households in the upper tier, which has experienced the stabilization of the population, have maintained their level of coffee production. Meanwhile, under heavy population pressure, those in Akeri (middle tier, former primary production area) have

retreated from coffee production to a greater extent. Moreover, those in Ngurdoto, which is located in the lower, peripheral production tier, have maintained their minimal production level while converting a large proportion of their coffee farms to other uses.

The relative importance of coffee to the household economy is very small, even in Songoro, which has maintained its level of production, and is currently not a major factor contributing to economic stratification. The livelihood strategies of coffee-producing households depend on the location and environment of the village, and the inter-village relationships and regional system that incorporates it. In particular, irrigated horticulture and dairy production activities have been stimulated by market liberalization measures in the mining and tourism sectors. The adoption of these two on-farm activities, however, has varied within the same regional system according to the availability of irrigation and the relative ease of transportation. Thus, in the relatively surplus-generating and monetized economy of Songoro, livelihood strategies are mainly based on non-farm or livestock activities, or a balanced portfolio including coffee production. These activities allow producers to realize a higher economic status. The richest Akeri have commanded the most favorable location for irrigated horticulture and dairy production, and so have been better able to select these options, resulting in a greater extent of retreat from coffee production. All of the livelihood strategies in this area are associated with high incomes. In sharp contrast, the low-income subsistence economy of the sample households in Ngurdoto is dominated by the livelihood strategies that are based on the production of staple crops, non-farm activities, and other agro-natural extraction activities. These are more or less isolated from irrigated horticulture and dairy production that have been stimulated by economic liberalization.

The retreat from coffee production has not automatically resulted in de-agrarianization or straightforward economic stratification, and a variety of livelihood activities based on available on-farm options have persisted in the regional system during the changes in the macroeconomy. Although non-farm strategies have led to higher incomes for younger generations, the extent of de-agrarianization has not been great and those in the process have been economically stratified. Overall, the adopted livelihood strategy of a household is not necessarily associated with a particular net income stratum. However, both the relatively successful livelihood strategies and the degree and nature of the de-agrarianization that have taken place have varied across the entire production area according to geographical conditions. Therefore, although the process has been a major rural socioeconomic change, it has by no means been spatially uniform. Geography has been an important mediator of the cross-sectoral impacts of macroeconomic policies on local livelihoods.

This study contends that household-level decisions are more or less determined by the areal differentiation of available livelihood strategies, and the possibility of livelihood diversification at the village level, which depends on the location, local environment, and regional system, as well as the cross-sectoral repercussions of economic liberalization. It is, however, important to strike a suitable balance between the analysis of a regional system at the village level and the

household-level analysis of the farmers who shape and modify it. In this way, it is possible to avoid overly deterministic explanations of changes in rural livelihoods.

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Photo 2-1: Coffee flowers and tray wire tables for sun drying pulped coffee beans at the central pulpery, the Mulala Rural Cooperative Society (Aug.1999).

Photo 2-2: Coffee berries and a disk pulper at the KCC Specialty Coffee Factory Central Menu, Nkoanekoli (Aug.2006).

Photo 2-3: A vegetable nursery on a former coffee plot, Akeri (Aug.2005).

Photo 2-4: Preparation of organic farming of vegetable on a former coffee plot, Akeri (Aug.2005).

Photo 2-5: Importation of crop residues from lower areas, off the Moshi-Arusha road (Aug.2006).

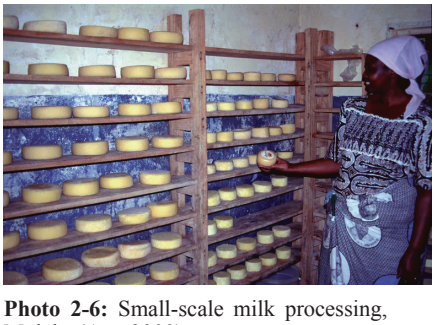

Photo 2-6: Small-scale milk processing, Mulala (Aug.2000).